

REMARKS

Claims 1-64 are pending in the application. Claims 1-6, 15-26, 28-31, 42, 43, and 47-51 have been rejected by the Examiner under 35 U.S.C. § 102(e) and § 103(a). The Applicant notes with appreciation that Claims 7-14, 33-41, 44-46, and 53-57 are allowed and that Claims 27, 32, and 52 would be allowed if rewritten in independent form. The amended Claims 27, 32, and 52 are now in independent form. Claims 58-64 have been added by this amendment.

The Specification has been amended to correct a drafting error. No new matter has been introduced.

An embodiment of the Applicant's invention shown in Fig. 1A is an optical coupler transmitting a light signal or beam 31 from an input fiber 16 to output fibers 20 using a multifaceted prism 24 and two lens elements, 22 and 30.

The principles of operation of one such prism 24 are illustrated in Fig. 2. Different portions of the input light signal or beam 40 exit the prism 24 through different facets 39 in different directions 41, depending on the facet's orientation and on the prism's index of refraction. The output light signals 41 are directed to different fibers 20. Note that the input light signal 40, after it enters the prism 24 through a facet and until its portions exit the prism 24 through multiple facets 39, does not interact with any prism facets.

The number and shape of the prism's facets and their location on the prism 24 may vary, for example, as shown in Figs. 5A-7C. The proportion of the signal sent to individual optical fibers 20 depends on position of each output fiber 20 with respect to the prism's facets 26 and 28 and on position of the prism 24 with respect to the input fiber 16. By changing these positions, in some embodiments, the proportion of the signal sent to each fiber may be changed as shown in Figs. 8A-9C.

§ 102(e) Rejection over U.S. Patent No. 6,529,325

The Examiner rejected Claims 1-3, 15-19, 42, 43, and 47-49 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,529,325 to Kokkelink et al. (hereinafter "Kokkelink").

Kokkelink discusses an optical splitter/combiner with two fibers 44 and 48 and a lens 42 on one end of the device and one fiber 32 and a lens 36 on the other end, as shown in Figs 1-3. The Kokkelink's device uses two birefringent wedges 16 and 14 for beam splitting and combining. The Examiner refers to them as "a multifaceted prism (14, 16)". Kokkelink describes the light signal exiting the wedges 14 and 16 only through a single surface or facet, see Kokkelink Figs. 1-3.

Amended independent Claims 1, 15, 42, and 47 include the limitation of at least two portions of the input light signal exiting the prism each through its respective facet. This limitation is absent in Kokkelink.

Claims 2-3, 16-19, 43, and 48-49 are dependent on amended independent Claims 1, 15, 42, and 47, and therefore contain all the limitations of amended Claims 1, 15, 42, and 47. Because limitations of amended Claims 1, 15, 42, and 47 have been shown above to be absent from the teachings of Kokkelink, either explicitly or impliedly, then Claims 2-3, 16-19, 43, and 48-49 are also not anticipated by Kokkelink.

Therefore, for the above-stated reasons, the Applicant respectfully requests reconsideration of the rejections under 35 U.S.C. § 102(e) over Kokkelink.

§ 102(e) Rejection over U.S. Patent No. 6,546,165

The Examiner rejected Claims 4-6 and 20-22 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,546,165 to Yoon et al. (hereinafter "Yoon").

Yoon discusses an optical multiplexing/demultiplexing device for either multiplexing input light signals or beams 14 and 16 into a single light signal or beam 20, or for demultiplexing an input signal 20 into two signals 14 and 16, as shown in Yoon Figs. 1, 2, 3, 5, and 6. The trajectory of the light signal 16 is modified by an optical path converting member 12. The Examiner refers to it as "a multifaceted glass prism (12)". The signal 16 either enters the optical path converting member 12 through the facet or surface 44 and exits it through the single facet or surface 46 or, if traveling in the opposite direction, enters it through the facet or surface 46 and

exists through the single facet or surface 44, as shown in Fig. 3. Yoon does not discuss or suggest any other manner of the light signal 16 exiting the optical path converting member 12.

Yoon also discusses beam splitters formed by bonding together prisms 91 and 93 or prisms 120 and 121 with a dielectric film, 94 and 122, respectively, between them, as shown in Figs. 7 and 8, respectively. Fig. 7 shows that, in demultiplexing mode, a light signal, 87 and 89, enters the prism 93 and subsequently one portion of the signal, 87, exits the prism 93 through the facet 94, while the other portion, 89, exits the prism 93 through another facet after being reflected at the facet 94. The portion 87 exists through the facet 94 while the portion 89 does not bypass the facet 94. Fig. 8 shows that in demultiplexing mode, a light signal, 101 and 103, enters the prism 121 and subsequently one portion of the signal, 101, exits the prism 121 through the facet 112, while the other portion, 103, exits the prism 121 through another facet after being reflected at the facets 112 and 110. The portion 101 exists through the facet 112 while the portion 103 does not bypass the facet 112. Yoon does not describe or suggest a light signal exiting a prism through more than one facet in any other manner.

Amended independent Claims 1 and 15 include the limitation of at least two portions of the input light signal exiting the prism each through its respective facet and bypassing the other portion's facet. This limitation is absent in Yoon.

Claims 4-6 and 20-22 are dependent on amended independent Claims 1 and 15 and therefore contain all the limitations of amended Claims 1 and 15. Because limitations of amended Claims 1 and 15 have been shown above to be absent from the teachings of Yoon, either explicitly or impliedly, then Claims 4-6 and 20-22 are also not anticipated by Yoon.

Therefore, for the above-stated reasons, the Applicant respectfully requests reconsideration of the rejections under 35 U.S.C. § 102(e) over Yoon.

§ 102(e) Rejection over U.S. Patent No. 5,740,288

The Examiner rejected Claims 23-26, 28, 50, and 51 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,740,288 to Pan et al. (hereinafter "Pan").

Pan discusses an optical splitter directing a polarized optical signal from an input optical fiber 10 to two output fibers 12 and 14, see Pan Fig. 1. A liquid crystal cell 20 rotates the polarization of the signal carried by the fiber 10. This rotation is controlled by a control signal imposed upon the cell 20. After this rotation, the beam splitting is performed by a beam splitter cube 24 formed by two right-angle prisms 21 and 22. The portion of the signal sent to each output fiber 12 and 14 depends on the state of the cell 20.

The Examiner refers to the two right-angle prisms 21 and 22 joined by an interface 23 as "a multifaceted glass prism (21, 22)". Note that the resulting cube 24 must be substantially non-uniform in order to provide a reflection on the interface 23. The signals on the fibers 12 and 14 are both interacting with the interface of facet 23 before exiting the prism 21. The signal exits the prism 22 only through a single facet.

Pan Fig. 2 shows a beam combiner where two polarized input signals enter the device through two input fibers 20 and 32 and the combined output signal leaves the device through an output fiber 34. Controllable cells 40 and 44 controllably rotate the polarization of the input signals before they enter a beam splitter cube 45 formed by two right-angle prisms 47 and 42 joined by an interface 43. This allows controlling the percentage of each input signal entering the output fiber 34. The signals exit the prisms 47 and 42 only through a single facet.

Pan Fig. 3 shows a variable polarization beam fixer combining and then splitting polarized light signals. Input signals (on fibers 50 and 52) are combined by a beam combiner cube 67 (formed by two right-angle prisms 61 and 62 joined by an interface 63), and the resulting signal is controllably rotated by a liquid crystal cell 60 and then split by a splitter cube 68 (formed by two right-angle prisms 64 and 65 joined by an interface 66). The signals exit the prism 61, 62, and 65 only through a single facet. The signals on the fibers 54 and 56 both interact with the interface of facet 66 before exiting the prism 64.

Pan Figs. 4 shows the use of a birefringent crystal 76 in combination with a liquid crystal cell 77 for splitting a signal carried by a fiber 70. Pan Fig. 5 shows an arrangement similar to Fig. 4 where instead of a birefringent crystal, a laminated polarization beam splitter 86 is used. The signals exit the birefringent crystal 76 and the laminated polarization beam splitter 86 only through a single facet.

Pan Figs 7-12 are equivalents of the arrangements illustrated in Pan Figs 1-5, except that the single liquid crystal cell in each arrangement has been replaced by tandem liquid crystal cells.

Amended independent Claims 23 and 50 include the limitation of at least two portions of the input light signal exiting the prism, each through its respective facet and bypassing the other portion's facet. This limitation is absent in Pan.

Claims 24-26, 28, and 51 are dependent on amended independent Claims 23 and 50, and therefore contain all the limitations of amended Claims 23 and 50. Because limitations of amended Claims 23 and 50 have been shown above to be absent from the teachings of Pan, either explicitly or impliedly, then Claims 24-26, 28, and 51 are also not anticipated by Pan.

Therefore, for the above-stated reasons, the Applicant respectfully requests reconsideration of the rejections under 35 U.S.C. § 102(e) over Pan.

§ 103(a) Rejection over U.S. Patent No. 5,740,288 and over U.S. Patent No. 5,740,288 in view of U.S. Patent Publication 2002/0126945

The Examiner rejected Claims 29 and 30 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,740,288 to Pan et al. (hereinafter "Pan") in view of U.S. Patent Publication 2002/0126945 to Konishi et al. (hereinafter "Konishi").

The Examiner rejected Claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Pan.

The Examiner uses Konishi for its discussion of anti-reflection coating. Konishi does not discuss at least two portions of an input light signal exiting a prism each through its respective facet

Amended independent Claim 23 includes the limitation of at least two portions of the input light signal exiting the prism each through its respective facet and bypassing the other portion's facet. As has been shown above, this limitation is absent in Pan and Konishi.

Claims 29-31 are dependent on amended independent Claim 23, and therefore contain all the limitations of amended Claim 23. Because limitations of amended Claim 23 have been shown above to be absent from the teachings of Pan and Konishi, either explicitly or impliedly, then Claims 29-31 are also not obvious over Pan and Konishi.

Therefore, for the above-stated reasons, the Applicant respectfully requests reconsideration of the rejections under 35 U.S.C. § 103(a) over Pan and Pan and Konishi.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned attorney at (978) 341-0036.

Respectfully submitted,

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